

PAGE: 1

RAW SEQUENCE LISTING
PATENT APPLICATION US/09/384,959DATE: 09/09/1999
TIME: 11:23:06

Input Set: I384959.RAW

This Raw Listing contains the General Information
Section and up to first 5 pages.

ENTERED

1 <110> APPLICANT: Sasisekharan, Ram
2 Shriver, Zachary
3 Liu, Dongfang
4 Venkataraman, Ganesh
5 <120> TITLE OF INVENTION: Rationally Designed Heparinases Derived
6 from Heparinase I and II
7 <130> FILE REFERENCE: M0656/7046/HCL
8 <140> CURRENT APPLICATION NUMBER: US/09/384,959
9 <141> CURRENT FILING DATE: 1999-08-27
10 <150> EARLIER APPLICATION NUMBER: US 60/098,153
11 <151> EARLIER FILING DATE: 1998-08-27
12 <160> NUMBER OF SEQ ID NOS: 14
13 <170> SOFTWARE: FastSEQ for Windows Version 3.0
14 <210> SEQ ID NO 1
15 <211> LENGTH: 2339
16 <212> TYPE: DNA
17 <213> ORGANISM: Flavobacterium heparinum
18 <400> SEQUENCE: 1
atgaaaagac aattataacct gtatgtgatt ttgttttag ttgaacttat gtttttaca 60
acaaaaggct attcccaaac caaggccat gtggtttgg aagacgtgga tggcgtatct 120
atgcccatac cccctaagac ccaccgcgt ttgttatctac gtgagcagca agttcctgac 180
ctgaaaaaca ggatgaacga ccctaaactg aaaaaagttt gggccgatat gatcaagatg 240
caggaagact ggaagccagc tgatattcct gaagttaaag actttcgttt ttattttaac 300
cagaaaggc ttactgttaag ggttgaacta atggccctga actatctgat gaccaaggat 360
ccaaaggtag gacgggaagc catcacttca attattgata cccttggaaac tgcaactttt 420
aaaccacgag gtgatatttc gagaggata gtgatatttc gagaggata ggcctgttta 480
tggttacagg ggcatttgt tatgactggt getacgatca gctgaaacca gaagagaaaa 540
cacgttttgtt gaaggcattt gtgaggctgg cccaaatgct cgaatgtgg tattcctccgg 600
taaaaagacaa gtctattgtt gggcatgctt cccaatggat gatcatgcgg gacctgtttt 660
ctgttagggat tgccatttac gatgaattcc ctgagatgta taacctggct gcgggtcggtt 720
ttttcaaaaga acacctgggtt gcccgaact gtttttatcc ctcgcataac taccatcagg 780
gtatgtcata cctgaacgta agatttacca acgacctttt tgccctctgg atattagacc 840
ggatggcgc tggtaatgtt ttaatccag ggcagcgtt tattcctttat gacgcgtatct 900
ataaaacccg cccccatggaa cagatttttag cagggtggaga tgttagattat tccaggaaaa 960
aaccaaaaata ttatacgatg cctgcattgc ttgcaggtag ctattataaa gatgaatacc 1020
ttaattacga attcctgaaa gatcccaatg ttgagccaca ttgcaaattt ttcgaatttt 1080
tatggcgcga tacccagttt ggaagtcgta agcctgtatga tttgccactt tccaggtact 1140
caggatcgcc ttttgatgg atgattgccc gtacccgatg gggtcggaa agtgtgattt 1200
cagagatgaa agtcaacgaa tattccttgc ttaaccatca gcatcaggat gcaggagcct 1260
tccagatcta ttacaaaggc ccgtggcca tagatgcagg ctcgtatata gtttcttcg 1320
gaggttataa cagtccgcac aacaagaact ttttaagcg gactattgca cacaatagct 1380
tgctgatTTTtta cgatcctaaa gaaactttca gttcgtcggg atatgtgga agtgcaccata 1440
ccgattttgc tgccaaacgat ggtggcggc ggttgcggg aaaagttgg attgcacccc 1500
gcgacctaa agaaatgctg gcaggcggatt tcaggaccgg caaaattctt gcccagggtt 1560

PAGE: 2

RAW SEQUENCE LISTING
PATENT APPLICATION US/09/384,959

 DATE: 09/09/1999
 TIME: 11:23:06

Input Set: I384959.RAW

45	ttggtcgga taaccaaacc cctgattata cttatctgaa aggagacatt acagcagctt	1620
46	attcgcaaa agtgaaggaa gtaaaacgtt catttctatt cctgaacctt aaggatgc当地	1680
47	aagttccggc agcgatgatc gttttgaca aggttagttgc ttccaatcct gatTTAAGA	1740
48	agttctgggt gtgcacagt attgagcagc ctgaaaataaa gggaaatcag attaccataa	1800
49	aacgtacaaa aaacgggtat agtgggatgt tggtaatac ggcttgctg ccggatgc当地	1860
50	ccaattcaaa cattacctcc attggcggca agggcaaaga cttctgggtg tttggatcca	1920
51	attataccaa tgatcctaaa ccggcacgg atgaagcatt ggaacgtgga gaatggc当地	1980
52	tggaaatcac tccaaaaaaag gcagcagccg aagattacta cctgaatgtg atacagattg	2040
53	ccgacaatac acagcaaaa ttacacgagg tgaagcgtat tgacgggtgac aaggTTGTTG	2100
54	gtgtcagct tgctgacagg atagttactt ttagcaaaac ttcagaaact gttgatc当地	2160
55	ccttgctt ttccgttgtt ggtaaaggaa cattcaaatt tgtgatgacc gatcttttag	2220
56	cggttacctg gcaggtgctg aaagacggaa aaataacttta tcctgc当地 tctgcaaaag	2280
57	gtgatgatgg accccttat tttgaaggaa ctgaaggaac ctaccgttt ttgagataa	2339
58	<210> SEQ ID NO 2	
59	<211> LENGTH: 772	
60	<212> TYPE: PRT	
61	<213> ORGANISM: Flavobacterium heparinum	
62	<400> SEQUENCE: 2	
63	Met Lys Arg Gln Leu Tyr Leu Tyr Val Ile Phe Val Val Val Glu Leu	
64	1 5 10 15	
65	Met Val Phe Thr Thr Lys Gly Tyr Ser Gln Thr Lys Ala Asp Val Val	
66	20 25 30	
67	Trp Lys Asp Val Asp Gly Val Ser Met Pro Ile Pro Pro Lys Thr His	
68	35 40 45	
69	Pro Arg Leu Tyr Leu Arg Glu Gln Gln Val Pro Asp Leu Lys Asn Arg	
70	50 55 60	
71	Met Asn Asp Pro Lys Leu Lys Lys Val Trp Ala Asp Met Ile Lys Met	
72	65 70 75 80	
73	Gln Glu Asp Trp Lys Pro Ala Asp Ile Pro Glu Val Lys Asp Phe Arg	
74	85 90 95	
75	Phe Tyr Phe Asn Gln Lys Gly Leu Thr Val Arg Val Glu Leu Met Ala	
76	100 105 110	
77	Leu Asn Tyr Leu Met Thr Lys Asp Pro Lys Val Gly Arg Glu Ala Ile	
78	115 120 125	
79	Thr Ser Ile Ile Asp Thr Leu Glu Thr Ala Thr Phe Lys Pro Ala Gly	
80	130 135 140	
81	Asp Ile Ser Arg Gly Ile Gly Leu Phe Met Val Thr Gly Ala Ile Val	
82	145 150 155 160	
83	Tyr Asp Trp Cys Tyr Asp Gln Leu Lys Pro Glu Glu Lys Thr Arg Phe	
84	165 170 175	
85	Val Lys Ala Phe Val Arg Leu Ala Lys Met Leu Glu Cys Gly Tyr Pro	
86	180 185 190	
87	Pro Val Lys Asp Lys Ser Ile Val Gly His Ala Ser Glu Trp Met Ile	
88	195 200 205	
89	Met Arg Asp Leu Leu Ser Val Gly Ile Ala Ile Tyr Asp Glu Phe Pro	
90	210 215 220	
91	Glu Met Tyr Asn Leu Ala Ala Gly Arg Phe Phe Lys Glu His Leu Val	
92	225 230 235 240	
93	Ala Arg Asn Trp Phe Tyr Pro Ser His Asn Tyr His Gln Gly Met Ser	
94	245 250 255	

PAGE: 3

RAW SEQUENCE LISTING
PATENT APPLICATION US/09/384,959

 DATE: 09/09/1999
 TIME: 11:23:06

Input Set: I384959.RAW

95 Tyr Leu Asn Val Arg Phe Thr Asn Asp Leu Phe Ala Leu Trp Ile Leu
 96 260 265 270
 97 Asp Arg Met Gly Ala Gly Asn Val Phe Asn Pro Gly Gln Gln Phe Ile
 98 275 280 285
 99 Leu Tyr Asp Ala Ile Tyr Lys Arg Arg Pro Asp Gly Gln Ile Leu Ala
 100 290 295 300
 101 Gly Gly Asp Val Asp Tyr Ser Arg Lys Lys Pro Lys Tyr Tyr Thr Met
 102 305 310 315 320
 103 Pro Ala Leu Leu Ala Gly Ser Tyr Tyr Lys Asp Glu Tyr Leu Asn Tyr
 104 325 330 335
 105 Glu Phe Leu Lys Asp Pro Asn Val Glu Pro His Cys Lys Leu Phe Glu
 106 340 345 350
 107 Phe Leu Trp Arg Asp Thr Gln Leu Gly Ser Arg Lys Pro Asp Asp Leu
 108 355 360 365
 109 Pro Leu Ser Arg Tyr Ser Gly Ser Pro Phe Gly Trp Met Ile Ala Arg
 110 370 375 380
 111 Thr Gly Trp Gly Pro Glu Ser Val Ile Ala Glu Met Lys Val Asn Glu
 112 385 390 395 400
 113 Tyr Ser Phe Leu Asn His Gln His Gln Asp Ala Gly Ala Phe Gln Ile
 114 405 410 415
 115 Tyr Tyr Lys Gly Pro Leu Ala Ile Asp Ala Gly Ser Tyr Thr Gly Ser
 116 420 425 430
 117 Ser Gly Gly Tyr Asn Ser Pro His Asn Lys Asn Phe Phe Lys Arg Thr
 118 435 440 445
 119 Ile Ala His Asn Ser Leu Leu Ile Tyr Asp Pro Lys Glu Thr Phe Ser
 120 450 455 460
 121 Ser Ser Gly Tyr Gly Gly Ser Asp His Thr Asp Phe Ala Ala Asn Asp
 122 465 470 475 480
 123 Gly Gly Gln Arg Leu Pro Gly Lys Gly Trp Ile Ala Pro Arg Asp Leu
 124 485 490 495
 125 Lys Glu Met Leu Ala Gly Asp Phe Arg Thr Gly Lys Ile Leu Ala Gln
 126 500 505 510
 127 Gly Phe Gly Pro Asp Asn Gln Thr Pro Asp Tyr Thr Tyr Leu Lys Gly
 128 515 520 525
 129 Asp Ile Thr Ala Ala Tyr Ser Ala Lys Val Lys Glu Val Lys Arg Ser
 130 530 535 540
 131 Phe Leu Phe Leu Asn Leu Lys Asp Ala Lys Val Pro Ala Ala Met Ile
 132 545 550 555 560
 133 Val Phe Asp Lys Val Val Ala Ser Asn Pro Asp Phe Lys Lys Phe Trp
 134 565 570 575
 135 Leu Leu His Ser Ile Glu Gln Pro Glu Ile Lys Gly Asn Gln Ile Thr
 136 580 585 590
 137 Ile Lys Arg Thr Lys Asn Gly Asp Ser Gly Met Leu Val Asn Thr Ala
 138 595 600 605
 139 Leu Leu Pro Asp Ala Ala Asn Ser Asn Ile Thr Ser Ile Gly Gly Lys
 140 610 615 620
 141 Gly Lys Asp Phe Trp Val Phe Gly Thr Asn Tyr Thr Asn Asp Pro Lys
 142 625 630 635 640
 143 Pro Gly Thr Asp Glu Ala Leu Glu Arg Gly Glu Trp Arg Val Glu Ile
 144 645 650 655

PAGE: 4

RAW SEQUENCE LISTING
PATENT APPLICATION US/09/384,959DATE: 09/09/1999
TIME: 11:23:06

Input Set: I384959.RAW

145 Thr Pro Lys Lys Ala Ala Ala Glu Asp Tyr Tyr Leu Asn Val Ile Gln
 146 660 665 670
 147 Ile Ala Asp Asn Thr Gln Gln Lys Leu His Glu Val Lys Arg Ile Asp
 148 675 680 685
 149 Gly Asp Lys Val Val Gly Val Gln Leu Ala Asp Arg Ile Val Thr Phe
 150 690 695 700
 151 Ser Lys Thr Ser Glu Thr Val Asp Arg Pro Phe Gly Phe Ser Val Val
 152 705 710 715 720
 153 Gly Lys Gly Thr Phe Lys Phe Val Met Thr Asp Leu Leu Pro Gly Thr
 154 725 730 735
 155 Trp Gln Val Leu Lys Asp Gly Lys Ile Leu Tyr Pro Ala Leu Ser Ala
 156 740 745 750
 157 Lys Gly Asp Asp Gly Pro Leu Tyr Phe Glu Gly Thr Glu Gly Thr Tyr
 158 755 760 765
 159 Arg Phe Leu Arg
 160 770
 161 <210> SEQ ID NO 3
 162 <211> LENGTH: 1379
 163 <212> TYPE: DNA
 164 <213> ORGANISM: Flavobacterium heparinum
 165 <220> FEATURE:
 166 <221> NAME/KEY: CDS
 167 <222> LOCATION: (173)...(1327)
 168 <221> NAME/KEY: mat_peptide
 169 <222> LOCATION: (236)...(1324)
 170 <400> SEQUENCE: 3
 171 cctttggga gcaaaggcag aaccatctcc gaacaaaggc agaaccagcc tgtaaacaga 60
 172 cagcaattca tccgcttca accaaagtga aagcatttaa tacaatacca gaatgtcgca 120
 173 tttcccttcc agcgtacttt ttgggtaaat aaccaataaa aactaaagac gg atg aaa 178
 174 Met Lys
 175 1
 176 aaa caa att cta tat ctg att gta ctt cag caa ctg ttc ctc tgt tcg 226
 177 Lys Gln Ile Leu Tyr Leu Ile Val Leu Gln Gln Leu Phe Leu Cys Ser
 178 5 10 15
 179 gct tac gcc cag caa aaa aaa tcc ggt aac atc cct tac cgg gta aat 274
 180 Ala Tyr Ala Gln Gln Lys Lys Ser Gly Asn Ile Pro Tyr Arg Val Asn
 181 20 25 30
 182 gtg cag gcc gac agt gct aag cag aag gcg att att gac aac aaa tgg 322
 183 Val Gln Ala Asp Ser Ala Lys Gln Lys Ala Ile Ile Asp Asn Lys Trp
 184 35 40 45 50
 185 gtg gca gta ggc atc aat aaa cct tat gca tta caa tat gac gat aaa 370
 186 Val Ala Val Gly Ile Asn Lys Pro Tyr Ala Leu Gln Tyr Asp Asp Lys
 187 55 60 65
 188 ctg cgc ttt aat gga aaa cca tcc tat cgc ttt gag ctt aaa gcc gaa 418
 189 Leu Arg Phe Asn Gly Lys Pro Ser Tyr Arg Phe Glu Leu Lys Ala Glu
 190 70 75 80
 191 gac aat tcg ctt gaa ggt tat gct gca gga gaa aca aag ggc cgt aca 466
 192 Asp Asn Ser Leu Glu Gly Tyr Ala Ala Gly Glu Thr Lys Gly Arg Thr
 193 85 90 95
 194 gaa ttg tcg tac agc tat gca acc acc aat gat ttt aag aaa ttt ccc 514

PAGE: 5

RAW SEQUENCE LISTING
PATENT APPLICATION US/09/384,959DATE: 09/09/1999
TIME: 11:23:06

Input Set: I384959.RAW

195	Glu Leu Ser Tyr Ser Tyr Ala Thr Thr Asn Asp Phe Lys Lys Phe Pro	
196	100 105 110	
197	cca agc gta tac caa aat gcg caa aag cta aaa acc gtt tat cat tac	562
198	Pro Ser Val Tyr Gln Asn Ala Gln Lys Leu Lys Thr Val Tyr His Tyr	
199	115 120 125 130	
200	ggc aaa ggg att tgt gaa cag ggg agc tcc cgc agc tat acc ttt tca	610
201	Gly Lys Gly Ile Cys Glu Gln Gly Ser Ser Arg Ser Tyr Thr Phe Ser	
202	135 140 145	
203	gtg tac ata ccc tcc tcc ccc gac aat gcg act act att ttt gcc	658
204	Val Tyr Ile Pro Ser Ser Phe Pro Asp Asn Ala Thr Thr Ile Phe Ala	
205	150 155 160	
206	caa tgg cat ggt gca ccc agc aga acg ctt gta gct aca cca gag gga	705
207	Gln Trp His Gly Ala Pro Ser Arg Thr Leu Val Ala Thr Pro Glu Gly	
208	165 170 175	
209	gaa att aaa aca ctg agc ata gaa gag ttt ttg gcc tta tac gac cgc	754
210	Glu Ile Lys Thr Leu Ser Ile Glu Glu Phe Leu Ala Leu Tyr Asp Arg	
211	180 185 190	
212	atg atc ttc aaa aaa aat atc gcc cat gat aaa gtt gaa aaa aaa gat	802
213	Met Ile Phe Lys Lys Asn Ile Ala His Asp Lys Val Glu Lys Lys Asp	
214	195 200 205 210	
215	aag gac gga aaa att act tat gta gcc gga aag cca aat ggc tgg aag	850
216	Lys Asp Gly Lys Ile Thr Tyr Val Ala Gly Lys Pro Asn Gly Trp Lys	
217	215 220 225	
218	gta gaa caa ggt ggt tat ccc acg ctg gcc ttt ggt ttt tct aaa ggg	898
219	Val Glu Gln Gly Gly Tyr Pro Thr Leu Ala Phe Gly Phe Ser Lys Gly	
220	230 235 240	
221	tat ttt tac atc aag gca aac tcc gac cggt cag tgg ctt acc gac aaa	946
222	Tyr Phe Tyr Ile Lys Ala Asn Ser Asp Arg Gln Trp Leu Thr Asp Lys	
223	245 250 255	
224	gcc gac cgt aac aat gcc aat ccc gag aat agt gaa gta atg aag ccc	994
225	Ala Asp Arg Asn Asn Ala Asn Pro Glu Asn Ser Glu Val Met Lys Pro	
226	260 265 270	
227	tat tcc tcg gaa tac aaa act tca acc att gcc tat aaa atg ccc ttt	1042
228	Tyr Ser Ser Glu Tyr Lys Thr Ser Thr Ile Ala Tyr Lys Met Pro Phe	
229	275 280 285 290	
230	gcc cag ttc cct aaa gat tgc tgg att act ttt gat gtc gcc ata gac	1090
231	Ala Gln Phe Pro Lys Asp Cys Trp Ile Thr Phe Asp Val Ala Ile Asp	
232	295 300 305	
233	tgg acg aaa tat gga aaa gag gcc aat aca att ttg aaa ccc ggt aag	1138
234	Trp Thr Lys Tyr Gly Lys Glu Ala Asn Thr Ile Leu Lys Pro Gly Lys	
235	310 315 320	
236	ctg gat gtg atg atg act tat acc aag aat aag aaa cca caa aaa gcg	1186
237	Leu Asp Val Met Met Thr Tyr Thr Lys Asn Lys Lys Pro Gln Lys Ala	
238	325 330 335	
239	cat atc gta aac cag cag gaa atc ctg atc gga cgt aac gat gac gat	1234
240	His Ile Val Asn Gln Gln Glu Ile Leu Ile Gly Arg Asn Asp Asp Asp	
241	340 345 350	
242	ggc tat tac ttc aaa ttt gga att tac agg gtc ggt aac agc acg gtc	1282
243	Gly Tyr Tyr Phe Lys Phe Gly Ile Tyr Arg Val Gly Asn Ser Thr Val	
244	355 360 365 370	

PAGE: 6

VERIFICATION SUMMARY
PATENT APPLICATION US/09/384,959

DATE: 09/09/1999

TIME: 11:23:06

Input Set: I384959.RAW

Line ? Error/Warning

Original Text

246 W Line data has been corrected

Pro Val Thr Tyr Asn Leu Ser Gly Tyr Ser G

247 W Invalid/Missing Amino Acid Numbering

375

380